EE461S - Operating Systems
Syllabus

Author: *Ramesh Yerraballi*

Fall 2016

General Information

Class Time (Classroom)	TTh 12:30 - 2:00 pm (BUR 112)
Contact	ramesh@mail.utexas.edu
Pre-requisites	EE319K and EE312
Office Hrs	M: 2:00-4:00pm; W: 2:00-4:30pm (AHG 102)
	TA Office Hours on Canvas
Website	UT Canvas
TAs	TAs: Kevin Espinoza, Gualberto Guzman and

Course Overview

This is an introductory course on Operating Systems with focus on learning by doing. The format of the course is project driven, where each component of the operating system is covered in detail in the lectures and the student will implement the component in a real operating system. The fundamental topics covered are in six parts. (a) Process API, The Shell - user interface to the OS, (b) Process management, the OS perspective, (c) Address Translation, Memory Management, Caching and Virtual Memory, (d) Thread Management with Scheduling, Concurrency and Synchronization. (e) File Systems and I/O Management. (f) Advanced topics like, Virtual Machines, Networking and Security.

Text
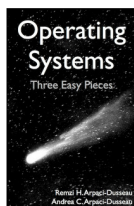
Operating Systems: Three Easy Pieces
Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau
Arpaci-Dusseau Books , March, 2015 (Version 0.90)
The book is free online. However, you can buy a hardcover for $36, softcover for $24 or an electronic PDF-version for $10 (my recommendation).

Lab Session

The lab session is where the TAs will both help with the projects and give details of what each project's requirements are. I was unable to officially put the lab session in the schedule, so for this semester it will be on a Friday each week at a time convenient for all. It will also involve demonstration of tools for code analysis, like linkers, loaders, debuggers and profilers. Attendance in the lab session is mandatory.

Grading Criteria

Assignment	Percentage
Programming Projects	50%
Exams: Mid-term (20%) and a Final Exam (20%)	40%
In Class Quizzes (Every Thursday except weeks of exams)	10%

Programming Projects

This class is a project driven class with emphasis on learning by implementing actual components of an operating system. Most of the learning happens in the programming projects. There are 5 projects in all. The software platform we will use is Pintos on Linux. Pintos is an instructional Operating System that runs on the x86 architecture. The building and running of the Pintos OS is only supported on Linux. Typical project activity involves, implementing a component of the OS by writing its code in C (develop –> make –> debug/test –> repeat). ***You will need a PC on which you can run Linux (any version with libc6).***

Exams

The mid-term exam will be held during regular class time. The syllabus for the mid-term exams will be posted on the class Canvas site. The final exam will be held according to university schedule. The final is NOT comprehensive.

Late Policy

All programming projects have a strict deadline. However, you can turn in any programming assignment by the deadline for the last programming assignment to earn a maximum of 75%. So, say you did not turn in Project1 at the scheduled deadline of September 13th. You may turn it in any time before the deadline for the last Project (November 29th) and earn a maximum of 75 points on it. The TA will not be obliged to grade a late submission before the last project. Please note that some projects depend on previous projects and so deferring your submission may not always be feasible.

Honor Code

Programming assignments, examinations must be the product of work performed exclusively by you. You may discuss problem sets in a group but your submission must be your own work. Allegations of Scholastic Dishonesty will be dealt with according to the procedures outlined in Appendix C, Chapter 11, of the General Information Bulletin, http://www.utexas.edu/student/registrar/catalogs/

Tentative Lecture Schedule

Date	Topics
Week 1	*Tue*: Introduction to Operating Systems, Process API –*fork, exec, signal* *Thu*: Programing Interface to the OS (the Shell),
Week 2	*Tue*: Process Management – Process Life Cycle: Creation, State transitions, suspend and resume and termination. *Thu*: Uniprocessor scheduling – FIFO, SJF, Fair scheduling, MLFQ
Week 3	**Project1 (Shell) Due Tuesday 9/13 (11:59pm)** *Tue*: Lottery Scheduling *Thu*: Multi-CPU scheduling
Week 4	*Tue*: Address Spaces, Memory API *Thu*: Address Translation

Date	Topics
Week 5	*Tue*: Segmentation *Thu*: Free-space Management
Week 6	**Project2 (Process API and System Call Support) – Due Tuesday 9/27 (11:59pm)** *Tue*: Paging *Thu*: Translation Lookaside Buffers, Advanced Page Tables
Week 7	*Tue*: Swapping Mechanisms *Thu*: Swapping Policies
Week 8	*Tue*: **Midterm – Syllabus (TBD) Tuesday 10/11 (In class)** *Thu*: Concurrency and Threads
Week 9	**Project3 (Virtual Memory – Demand Paging) Due Tuesday 10/18 (11:59pm)** *Tue*: Thread API *Thu*: Locks and Condition Variables
Week 10	*Tue*: Semaphores – Producer-Consumer problem *Thu*: Deadlocks - Dining Philosophers problem
Week 11	*Tue*: Advances topics in Concurrency *Thu*: Posix Threads API
Week 12	**Project4 (Threads and Concurrency) Due Tuesday 11/8 (11:59pm)** *Tue*: Disk Scheduling Algorithms, Buffer Caches *Thu*: Files and Directories

Date	Topics
Week 13	*Tue*: Inode structure *Thu*: FAT32, NTFS, Journaling File Systems (EXT4 - Linux, HFS+ – Mac OSX)
Week 14	*Tue*: RAID, Distributed File Systems – NFS *Thu*: Networking, Ports and Inter-Process Communication
Week 15	**Project5 (File System Management) Due Tuesday 11/29 midnight** *Tue*: Virtual Machines, *Thu*: OS Security, Malware
	Final Exam (Syllabus – Not Comprehensive) **Thursday, December 8, 9:00am-12:00noon**

Disclaimer

Instructor reserves the right to modify course policies, the course schedule, and assignment/quiz/exam point values and due dates.

Additional Details

The deadline for dropping without possible academic penalty is 11/1/2016

The University of Texas at Austin provides, upon request, appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4241 TDD, or the College of Engineering Director of Students with Disabilities, 471-4321.